

Brief Statement

Amended Claim 1 is directed to a semiconductor device including a gate electrode and a gate insulating film. Claim 1 is amended so as to include the limitation of the original claims 2 and 8, and to include the limitation that B is more than A. For this reason, these original claims are deleted. In this regard, as shown in FIG. 9 and Table 1, in the vicinity of an interface between the gate insulating film and the base, the concentration of hydrogen is more than the concentration of nitrogen.

Each of the cited documents D1 to D4 discloses an insulating film in which almost half of oxygen atoms of a SiO_2 film are respectively replaced by nitrogen atoms. For this reason, the insulating film disclosed in each of the cited documents D1 to D4 constitutes merely a SiON film.

On the other hand, an insulating film of the present invention is a gate insulating film for a semiconductor device. The present invention has a technical feature that the gate insulating film of semiconductor device has a region in the vicinity of an interface between the gate insulating film and the base where A and B satisfy the relation: B/A is 10 or less (here, B is more than A) in the case where the total concentration of the at least one kind of element in the region is defined as A and the total concentration of hydrogen in the region is defined as B, in which the region is at least a part of the gate insulating film in the thickness direction thereof. This makes it possible to prevent SBD or SILC from occurring even in the case of thinning the insulating film and to have high resistance to a dielectric breakdown such as SILC, TZDB, or TDDB while keeping characteristics of a silicon oxide film.